

THE AFRICAN ELEPHANTS' TOE NAILS

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ABSTRACT

Toe nails on front and hind feet of 689 culled elephants from three populations, two from Uganda and one from Kenya, were counted. Nineteen combinations were found, recorded as nails present on right front foot/left front foot/right hind foot/left hind foot. In addition, toenails from 33 fetuses are compared with their dams' toe nail combinations. The results nullify previous use of toe nail numbers for taxonomic purposes.

Keywords: elephant physiology, taxonomy

INTRODUCTION

Observations were made on the toe nails of three populations of the African savanna elephant *Loxodonta africana* Blumenbach, 1797 to test the contention that the savanna elephant *L. africana* has four toe nails on the front foot and three on the hind, which differentiates it from the forest elephant *L. cyclotis* Matschie, 1900, which has five on the front foot and four on the hind (Frade, 1931). Smithers (1983) was among others who followed this claim. Parker (2017) records the Wata of eastern Kenya had asserted that elephant family units displayed common toe nail combinations proving to them that members were related. The data on toe nails were collected as part of a wide-ranging study of elephant biology and management that has been reported elsewhere (see Laws *et al.*, 1975 for a description and bibliography).

MATERIALS & METHODS

Between 1965 and 1967 a shot sample of 2000 elephants was taken from two populations in Uganda's Murchison Falls National Park: one north of the Nile (MFPN); and the other south of it (MFPS). A further 300 elephants were sampled in Kenya's Tsavo National Park East (TSO) north of the Sabaki River in the vicinity of Koito. To randomise sampling, the first group or groups of animals encountered each day was taken regardless of their composition,

and all members of a group were shot. For the present study, nail counts on 191 (MFPN), 202 (MFPS) and 296 (TSO) elephants were taken. All toe nails on the front and hind feet were counted and recorded as four-digit codes in the sequence: right front; left front; right hind; and left hind (*e.g.* 5533 would indicate five nails on each front foot and three on each hind foot). To test the contention that as a genetic feature elephant family members tended to have the same toe nail combinations, nails were also counted on fetuses large enough for nails to be observed and compared with their mothers' combinations.

RESULTS

Count results are summarised in tables 1 and 2. By far the most frequent combination is 5544 in all 3 populations (61.8% MFPN, 78% MFPS, 69% TSO). The next most frequent is 5533 (10.3% of all animals), followed by 4433 (6.4%) and 4444 (2.7%). These four combinations account for 87.6% of animals sampled. A further 15 less frequent combinations (all <2% of animals) accounted for the remainder.

Of the 19 combinations observed, 47% occurred in all three populations, 21% did not occur in MFPS. MFPN had three sets unique to it (3454, 3355 & 3344), TSO had one (5545), while MFPS had none. MFPN and TSO shared four sets (5433, 5434, 4534 & 4533) that did not occur in MFPS. Three MFPN combinations (3454, 3355 & 3344) differed from all others in having more nails on the hind than the front feet. In the four most frequent combinations both front and hind feet nails were symmetrical. In the 15 remaining combinations, half (eight) had symmetrical front feet but asymmetrical hind feet, and half (seven) had symmetrical hind feet but asymmetrical front feet.

Toe nails were counted in 33 fetuses and compared with their mothers' (table 3). They matched in 15 (45.5%) cases of which 14 had the commonest combination (5544), and one had the fourth most common combination (4444). In the remaining 18 cases the two combinations were different, and included both common and rare combinations.

DISCUSSION

In the elephant, although five phalanges are retained in both front and back feet, separated toes have been replaced by a single pad that is circular on the front foot and oval on the hind. On both front and hind feet there is a medial nail flanked on either side by one or two smaller lateral nails. The larger nails are all on the foot's leading edge. The smallest distal lateral nails, when present, are on the side of the foot. Where fewer than five nails occur it is always caused by the absence of one or more of the distal lateral nails. No case was observed of either foot lacking the medial and proximal lateral nails.

Data from the populations considered here also encompass the combination reported for the forest elephant by Frade (1931). His assertion that 4433 of the savanna elephant distinguishes them from the forest elephant with 5544 must be abandoned. For the savanna elephant it seems that 5544 is by far the most frequent combination and this characteristic East African combination may hold good elsewhere.

Smithers' (1983) contention that where fewer than five and four hooves (nails) occur it is due to loss or wear must also be abandoned as the foetal data show that such combinations are congenital. Loss may sometimes occur, but we have never seen scarring or other evidence of it, possibly because regrowth may be expected except in cases of gross foot

Table 1. Toe nail counts: column 1 shows the number of different sets occurring in each population and combined; top line = the four digit codes representing nail sets (right front/left front/right rear/left rear) counted.

Sets	Toe Combs	5545	5544	5543	5534	5533	5444	5434	5433	4544	4534	4533	4444	4443	4434	4433	3454	3355	3344
16	MFNP %	61.8	0.6	1.6	11.0	0.6	1.6	2.7	2.7	1.6	0.6	0.6	3.7	10.0	0.6	0.6	0.6	0.6	
11	MFPS %	73.3	1.0	1.0	8.0	2.0	0.5	0.5	5.0	3.5	0.5	0.5	5.0	5.0	0.4	0.4	0.4	0.4	
16	TSO %	0.4	69.0	3.1	2.7	11.5	0.4	0.7	0.7	2.1	0.4	2.1	1.4	0.4	0.4	5.1	0.2	0.2	
19	All Three %	0.2	68.2	1.8	1.9	10.3	0.9	0.8	1.1	1.8	0.6	1.1	2.7	0.3	0.3	6.4	0.2	0.2	

Table 2. Illustrating the toe nail combinations common to all three populations, those common to MFPN & TSO only, those common to MFPS & TSO, and those unique to one population.

	MFPN, MFPS & TSO				MFPN & TSO		MFPS & TSO		Unique										
Combinations	5544	5543	5534	5533	5444	4544	4455	4444	4433	5434	5433	4534	4533	4443	4434	5545	3454	3355	3344
	47%										21%		11%		21%				

Table 3. Mother and foetus toe nail combinations in 33 elephants from 3 East African populations divided into those with the same and those with different combinations.

Location	Serial #	Mother	Foetus	same	different
MFPN	56	5544	4433		1
	71	5544	4433		1
	86	5544	5544	1	
	93	5544	5544	1	
	111	5544	5433		1
	114	5544	5544	1	
	134	5544	5533		1
	140	5544	5544	1	
	145	5544	5544	1	
	146	5544	5544	1	
	158	5544	4433		1
	21	5533	4433		1
	97	5533	5544		1
	130	5533	5544		1
	38	4544	4433		1
45	4444	4433		1	
94	4433	5544		1	
Total				6	11
MFPS	223	5544	5544	1	
	340	5544	4433		1
	350	5544	5544	1	
	353	5544	5544	1	
	334	4444	4444	1	
Total				4	1
TSAVO	26	5544	5544	1	
	55	5544	4433		1
	182	5544	5544	1	
	191	5544	5544	1	
	247	5544	5544	1	
	300	5544	5544	1	
	188	5543	5544		1
	21	5533	5544		1
	90	5533	4433		1
	184	5533	5544		1
	220	5533	5544		1
Total				5	6
TOTALS				15	18

trauma. Similarly, we have not seen evidence of wear to the point of loss in any age class. There is also no obvious reason why loss or wear would only occur to the lateral, least used, nails, and never the nails on the leading edge of the foot, as Smithers contended. The opposite would seem more likely given that the leading nail bears the brunt of impacts.

That toe nails show familial patterns is not supported by the foetal data in which there is no bias towards the maternal combination. These results decisively nullify previous use of toe nail numbers for taxonomic purposes.

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REFERENCES

- Frade, F. (1931). Sur l'existence en Afrique de deux espèces d'éléphants. *Bulletin de la Société Portugaise des Sciences Naturelles* **11**: 135.
- Laws R.M., I.S.C. Parker & R.C.B. Johnstone (1975). *Elephants and their Habitats: the Ecology of Elephants in North Bunyoro, Uganda*. Oxford University Press, Oxford.
- Parker, I.S.C. (2017). Wata bows, arrows, poison & elephants. *Kenya Past & Present* **44**: 43–56.
- Smithers, R. (1983). *The Mammals of the Southern African Subregion*. University of Pretoria, Pretoria.